KECHIKA ENHANCEMENT PROJECT OF NORTHEASTERN B.C. REVISED WORKING PLAN FOR 1984–1987

Ministry of Environment
Fish and Wildlife Branch
Fort St. John, B.C.

Wildlife Working Report No. WR-9
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by

J.P. Elliott

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SUMMARY

This working plan describes the study areas, design, and methods used to assess population responses of caribou (Rangifer tarandus), moose (Alces alces), and mountain sheep (Ovis dalli stonei) to reduced levels of wolf predation, for the period 1984-1987. Ungulates will be monitored by aerial surveys to detect changes in numbers and in proportions of young animals to adult females, both in an area where wolves are removed and where they are left undisturbed. The procedures for assessing the response of sheep range to prescribed fire is also described. These ranges will be monitored by estimating productivity and nutritive content of forage. Wolf control will be preceded and followed by aerial surveys to measure changes in density, pack size, and pack area. Wolves will be shot from helicopter by government personnel, consistent with relevant policies and procedures. The project will be documented annually by working plans and progress reports, and at the project's end by a job completion report.

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INTRODUCTION

BACKGROUND

This document describes the current design and methods used for the Kechika enhancement project. Significant improvements have been made since the initial plan (Fish and Wildlife 1982), although the basic thrust remains the same.

Present numbers of caribou, moose, mountain sheep, and elk in northeastern B.C. are well below objectives (Elliott 1984a), and have declined substantially (Elliott 1984b; Bergerud et al., in prep.). The immediate principle factor operant appears to be low recruitment (Table 1). (Recruitment is defined as the proportion of a population or herd of a given age or older, for one or both sexes, which that given age group comprises). Recruitment rates are well below those necessary to sustain population levels let alone allow for rebuilding. Identification of causative agents and implementation of a program to reverse these declines thus became a high management priority. Further, there was concern that factors resulting in decline of caribou, moose, and mountain sheep would also affect elk and thwart plans to increase their numbers.

For caribou, predation by wolves was suggested as a major factor limiting population growth (Bergerud 1978). Consequently, the Fish and Wildlife Branch initiated a project in the Horseranch area to monitor the response of caribou to a reduction in wolf numbers. Wolves were reduced in a relatively small area of 2590-5180 km^2 (1000-2000 mi^2) for three years. The fall recruitment of calves increased to 16-17% for the three years of wolf reduction, compared to 4-6% recruitment prior to reduction and following re-establishment of wolves to pre-reduction levels (Elliott et al. 1984; Bergerud et al., in prep.). Caribou numbers increased during wolf reduction and then began to decline when typical wolf densities returned.

Results of the Horseranch project and other ongoing work in northeastern British Columbia suggested the value of a similar trial for moose and mountain sheep. The Kechika unit was selected as the location for this project because of its high capability for producing these animals, its unusually high wolf densities, and the apparent declining ungulate numbers (Elliott 1984a). Initially, it was proposed to reduce wolves over approximately 7800 km^2 (3000 mi^2), with range enhancement and elk transplants also incorporated in the experimental design (Fish and Wildlife 1982). However, input from other workers and our own experience indicated that design changes were required.

The following changes were made to the original working plan for the Kechika project:

1) the range enhancement treatment for moose was dropped to simplify the design.

2) the aspect dealing with elk transplants was dropped because it was judged that their proportion of total ungulate biomass (57 were transplanted in 1984 to an existing herd estimated at <25) was so low as to not be a significant factor.

Table 1. Juvenile proportions for caribou, moose, and mountain sheep in parts of the Kechika and Deadwood study areas where wolves have not been reduced, 1983-84.

Species	Proportion	Value (N)
Caribou	Autumn calves/total as a percent	6 (250)*
Moose	Late winter calves/100 adult cows	6 (71)**
Mtn. sheep	Late winter yearlings/100 adult ewes	7 (107)**

* from Bergerud et al. (in prep.).

** from Elliott (1984b).

Table 2. Response of moose and mountain sheep to wolf reduction in the Kechika area, February - March 1984 surveys (Elliott 1984b).

Species	Wolf status	Ratio per 100 adult females		Sample size*
		Young of year	Young of prev.year (yearlings)	
Moose	untreated	6	15	81
Moose	reduced	58	36	128
Mtn. sheep	untreated	18	7	387
Mtn. sheep	reduced	38	14	527

* young of the year, yearlings, and adult females (2+years old).

3) caribou were added to the list of species being monitored, as they occur in the expanded removal area.

4) the reduction area was enlarged because the rapid recolonization by wolves meant that the effects of wolf reduction did not last for 12 months; and because movements by moose between the removal and non-removal zones potentially confounded their response to reduced wolf predation. Further, since the recolonizing of the removal area appeared to involve substantial emigration from the nearby non-removal comparison area, the latter area is no longer qualified as an undisturbed experimental control area. The enlarged area is similar in size (18 400 km^2) to that used in Alaska (17 100 km^2) by Gasaway et al. (1983).

The enlarged area has two additional advantages. Firstly, as it includes the Horseranch range where wolf/caribou interactions previously were studied (Elliott et al. 1984), a further evaluation of that interaction will be possible. Secondly, by incorporating the high wolf area of the previous three years, it provides a temporal comparison.

Despite earlier problems with recolonization and migration, the initial responses of moose and mountain sheep populations have been significant (Table 2). By 1984, after three years of wolf reduction, moose calves were ten times as abundant, and mountain sheep lambs and yearlings were twice as abundant in the reduced wolf area compared to the area where wolves were not removed (Elliott 1984b).

OBJECTIVES

The general objectives of the Kechika trial are to test the effectiveness of wolf control as a technique to increase numbers of caribou, moose, and mountain sheep; and to examine the value for mountain sheep of ranges improved by prescribed fire.

Specific work objectives of the project are as follows:

a) to estimate annual late winter pack sizes and densities of wolves on treated (wolves reduced) and untreated (wolves not reduced) areas.

b) to reduce annual wolf densities in the reduction area to 1 wolf/260-390 km^2 (100-150 mi) until 1987.

c) to estimate moose densities in representative subunits of reduction and untreated areas every three years.

d) to estimate annually, the proportions of moose aged 6, 10, 18 and 22 months relative to adult cows (> 23 months) in reduction and untreated areas.

e) to estimate sheep numbers in representative subunits of reduction and untreated areas every three years.

f) to estimate annually, the proportion of sheep aged 10 and 22 months relative to adult ewes (aged > 23 months) in reduction and untreated areas.

g) to burn 2000 - 8000 ha annually on mountain sheep ranges.

h) to monitor annually, responses of vegetation to burning in terms of productivity and nutritive value of grasses.

i) to monitor annually, proportion of calves in caribou herds at rut, in the wolf reduction area.

The initial proposal for methods to meet these objectives was presented in a working plan (Fish and Wildlife Branch 1982).

STUDY AREA

Figure 1 indicates the area relative to the remainder of the Province and the alternate areas proposed for comparisons. These latter areas are Deer Trout, Finlay-Pelly, and Jennings-Blue. The project area is indicated in Figure 2, and is described in Elliott and Webster (1982) and Elliott et al. (1984b).

METHODS

DESIGN

Primarily, the design is a comparison of differing treatments over time (Table 3). However, comparison between areas during the same time period provides a valuable additional way of evaluation, with the Deer-Trout, Finlay-Pelly, or Jennings-Blue units as potential comparison areas for moose and mountain sheep. Continuing surveys of caribou in the Spatsizi and Level-Kawdy areas should provide comparisons for caribou.

MONITORING

This section describes the methods proposed to monitor the population responses of the target species. In all monitoring activities, exact timing will be determined by weather, snow conditions, animal distribution, and logistics. The monitoring will continue for the project's duration and longer, if necessary, to interpret findings.

Moose

The objectives of monitoring moose are to estimate changes in numbers (densities), and changes in the survival of young to the ages of 6, 10, 18, and 22 months. Population estimates will be made in representative portions of the study area. The design and execution of population estimates will follow methods presented by Gasaway et al. (in review). The survey area will be subdivided into sample units and stratified into density strata based on preliminary flights. Sample units for census, will be chosen randomly by selection without replacement, with the sample size per stratum proportional to expected relative densities (optimal allocation of search effort.)

A population density estimate was made for the Middle Creek subunit (Fig. 2) in the wolf removal area in March 1984 (Elliott 1984b). The data collected were used to plan for the proposed resurvey in 1987. Van Ballenberghe and Dart (1982) suggest a maximum finite rate of increase (λ) in Alaskan moose of 1.14. Thus with an estimate of 289 moose in 1984, 428 moose are projected in 1987 ($289(1.14^3)$ or a 48% increase. The required variance for the 1987 survey, based on detecting a 40% increase in population size, with $\alpha = 0.10$ and $\beta = 0.20$ is ≤ 1834. As the variance in 1982 was 966, a survey of similar intensity is anticipated for 1987.

To monitor survival of young, two aerial surveys will be made, one in November to estimate sex ratios and to estimate survival to 6 and 18 months; and one in March to estimate survival to 10 and 22 months. For both surveys, the aim will be to classify at least 75-100 adults/study area. Also, every attempt will be made to minimize biased estimates that can result when areas are not surveyed randomly, e.g., flying only low elevations and missing bulls on upper slopes. Data will be expressed as young/100 females.

Stone sheep

The objectives of monitoring mountain sheep are to estimate population size and the ratios of 10 month and 22 month old young to adult ewes. Population estimates will be made for representative sub-areas through attempted total counts by intensive helicopter searches.

Recruitment estimates will be obtained through helicopter surveys of sheep bands in March. As with moose, attempts will be made to classify 75-100 animals per study area, although slightly smaller samples than this may occur in small bands. Data will be expressed as young/adult female.

Wolves

Wolves will be surveyed to determine total numbers, pack size, movements, and distribution. These data will be gathered by fixed-wing aircraft and helicopter surveys in late February and March. Following wolf reduction, one or two monitoring flights are planned to confirm the level of reduction achieved, and to check for possible movements of wolf packs between treatment units.

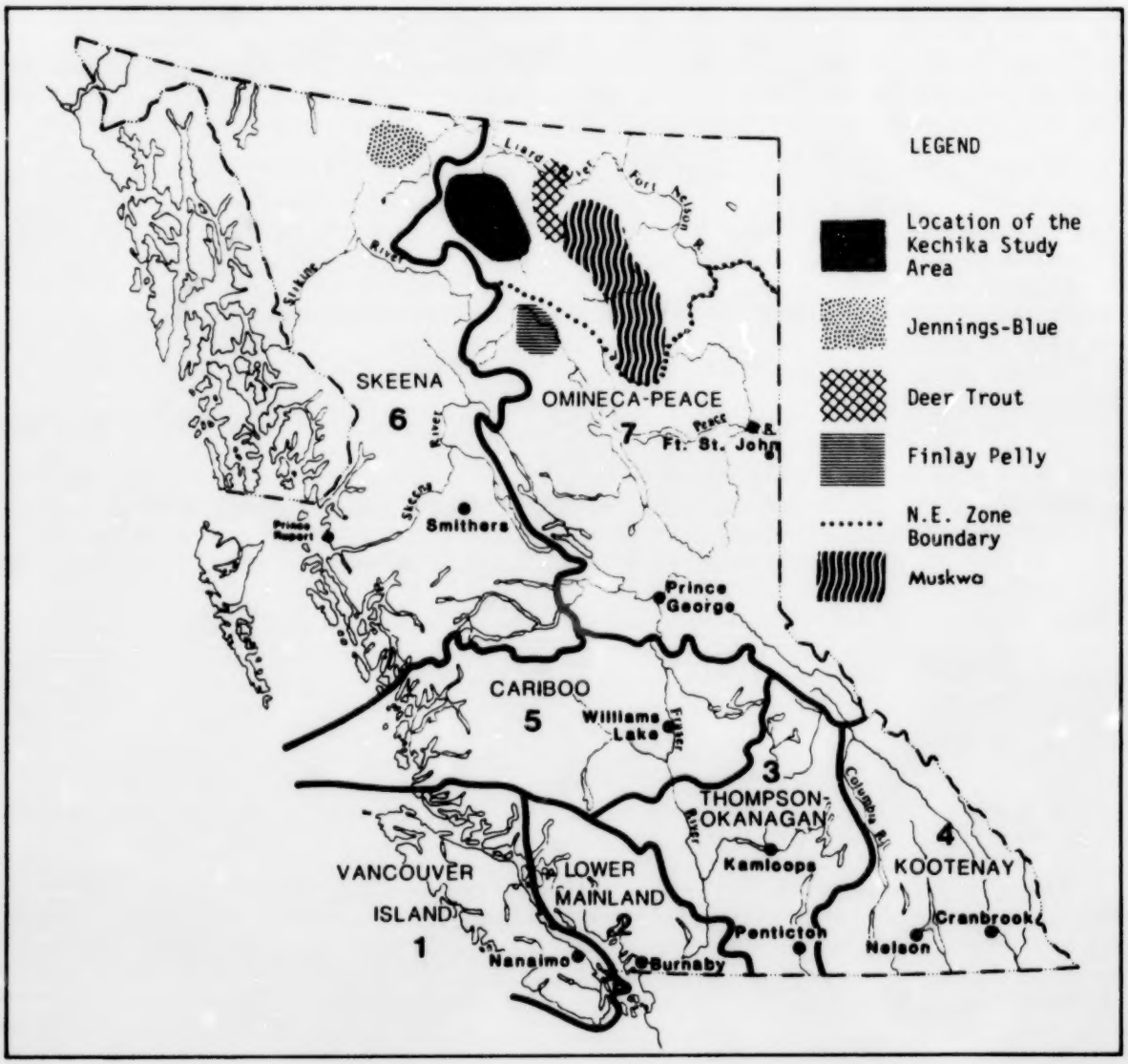

Figure 1. Map of British Columbia showing the location of areas referred to in the text and the zonal NE administration boundary.

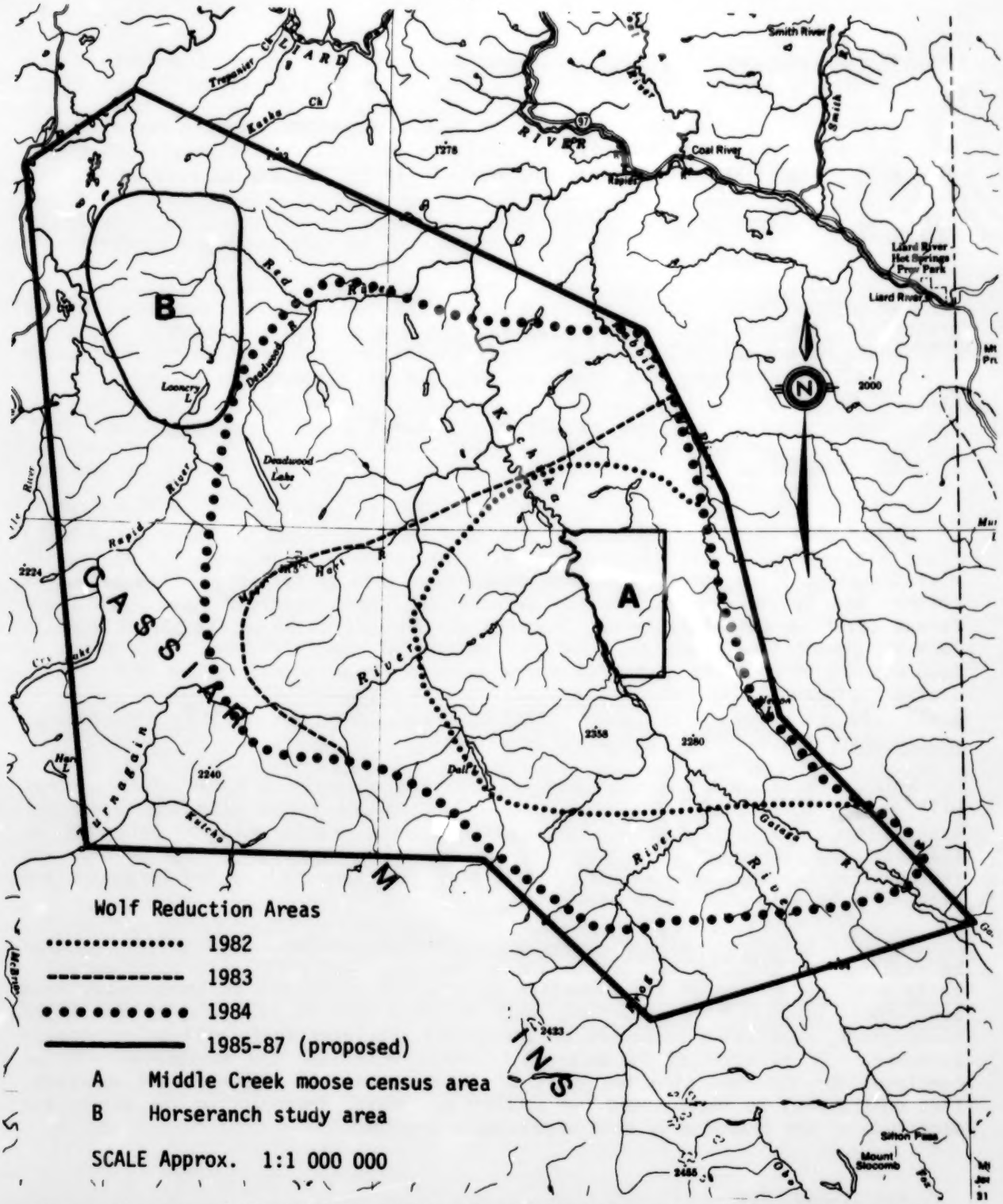

Figure 2. Map of the Kechika study area showing the past and proposed areas for wolf reduction, the Horseranch study area of Elliott et al (1984), and the Middle Creek moose density survey area.

Caribou

Caribou will be monitored to determine population trend and fall recruitments. Fall rut areas will be searched intensively by helicopter in a consistent manner each year, with calves, adult cows, and adult bulls identified.

TREATMENTS

Two treatments are proposed: wolf control for all ungulate prey species and prescribed fire for mountain sheep only. The aim of the wolf control treatment will be to reduce wolves to about one wolf/260-390 km^2 (100 to 150 mi^2) or as close to 20% of the pre-reduction level as possible to allow a clear indication of response by the prey.

Wolf Reduction

Wolves will be killed by aerial gunning from a helicopter. Where possible, a fixed wing aircraft will be used initially to locate wolf packs. The applicable Ministerial policies, procedures, and regulations will be followed. This method of control was selected over trapping because the open nature of the terrain and forest cover in the study area. Trapping was thought to be unfeasible, given the lack of ground access and the need for removal of specific packs. Poisoning by 1080 was not proposed as a control method because its effectiveness is difficult to evaluate rigorously as carcasses are not usually recovered. Also, it is costly to apply and retrieve baits under existing legal requirements for the use of pesticides, when access is primarily by aircraft.

Wolf carcasses will be recovered for necropsy whenever possible. Each carcass will be sexed and aged. Skulls will be collected and lodged with the provincial museum for future reference. Female reproductive tracts will be collected as feasible and analysed to determine reproductive status, litter size, and reproductive history, if possible. Additional analyses, such as for parasites and diet, will be attempted where possible.

The wolf reduction will be conducted in February or March, but wolves may also be reduced incidentally earlier in the winter in association with other surveys. It is proposed to repeat the reduction program for a minimum of three years from achievement of full area reduction, that is, from 1985 to 1987 (Table 3). After three years, population responses of the target ungulates again will be critically assessed. If no response is apparent, control will stop and monitoring will be continued for the remaining two years of the program. If responses are apparent, then control may be recommended for another two years, depending on the nature and magnitude of the response by both ungulates and wolves.

Prescribed Fire

The purpose of burning sheep habitat is to remove woody vegetation in order to improve existing range and create new range adjacent to it, that is, enhancement

and expansion of range. The expected range responses are increased production of grass forage species and increased removal rates of snow through greater exposure to sun and wind action. The expected animal responses are increased survival of young sheep, and increased horn growth as reflected in horn annuli.

Burns will be sited primarily on fall, spring, and winter ranges. As much as possible, burning will be done in the spring as soon as conditions permit. All burns will be conducted in accordance with the protocol agreement on prescribed fire between the Ministries of Environment and Forests.

Vegetative responses to burning will be recorded by sampling representative sites in burned and unburned locations. Each study site will be characterized, generally following methods outlined by Walmsley et al. (1980). In addition, plant productivity will be assessed on an air-dried weight basis, by clipping five 1 m^2 plots/site. Qualitative evaluation will be based on analyses of forage samples. Photographs will be taken. An annual burning program is planned to continue during the study. The target is to burn 2000 to 8000 ha annually. Actual areas burned, however, will be influenced by several factors such as funding, weather conditions, and logistics.

SCHEDULING

Over a typical year, project activities will take place at six times. In April-June, time will be allocated to prepare an annual progress report for the preceding year, and a working plan for the coming year. Prescribed burning is planned for May or June, depending on snow melt, weather, and plant phenology. In October, caribou will be surveyed. In November, the first monitoring flight for moose is scheduled. The remaining monitoring flights for all species will be conducted in February and March. Wolf reduction will occur primarily in February-March, and opportunistically earlier in the winter in association with other surveys.

In the final year of the project, additional time will be allocated for preparing a job completion report. It is expected that this task will take staff time into the following fiscal year.

Table 3. Historical perspective and future plans for wolf reduction and prescribed fire in the Kechika area, 1976 - 1987.

Year (Apr 01 to Mar 31)	Species enhanced by treatment						Wolf reduction area-km^2 (mi^2)	Comparison procedure for wolf reduction treatment*
	range enhancement			wolf reduction				
	caribou	moose	mtn.sheep	caribou	moose	mtn. sheep		
1976-1977	N**	N	N	N	N	N	0	No control
1977-1978	N	N	N	Y***	S	N	3630(1400)	Baseline
1978-1979	N	N	N	Y***	S	N	3630(1400)	Separated area plus temporal
1979-1980	N	N	N	Y***	S	N	5180(2000)	Separted area plus temporal
1980-1981	N	N	N	N	N	N	0	Separated area plus temporal
1981-1982	N	N	Y	N	Y	Y	3830(1480)	Baseline
1982-1983	N	N	Y	N	Y	Y	7120(2750)	Adjacent area plus temporal
1983-1984	N	N	Y	N	Y	Y	9970(3850)	Adjacent area plus temporal plus baseline
1984-1985	N	N	Y	Y	Y	Y	18400(7100)	Separated area plus improved temporal
1985-1986	N	N	Y	Y	Y	Y	18400(7100)	Separated area plus improved temporal
1986-1987	N	N	Y	Y	Y	Y	18400(7100)	Separated area plus improved temporal

*Note that ungulate response occurs in seasons following wolf reductions.
**N = no, Y = yes, S = some.
*** as part of Horseranch Range project.

RESULTS AND REPORTS

The main result expected from this project is information that will guide wildlife managers in allocating money and effort in using prescribed fire or wolf reduction techniques. This information will include an evaluation of responses of animal populations (both wolves and ungulates) and cost/benefit ratios, to the extent possible. Additionally, increases in ungulate populations will improve the supply of wildlife available for public use within the project area.

The planned reports and reporting schedule is as follows:

Working plans: due annually in October
Progress reports: due annually in October
Job completion report: by the end of the fiscal year following project completion.
Management recommendations: as appropriate following report completion.
Journal articles: as appropriate.

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